

Brose Fahrzeugteile GmbH & Co.
Kommanditgesellschaft, Coburg
Ketschendorfer Strasse 38-50

D-96450 Coburg

BRO 1424 - 2002 085 EM

Seat assembly for a motor vehicle seat

Description

The invention relates to a seat assembly for a motor vehicle seat according to the generic part of claim 1.

Such a seat assembly comprises a seat element that constitutes a component of the seat structure of a motor vehicle seat; a tubular drive element (drive tube) connected pivotably (around its longitudinal axis) to the seat element that constitutes a component of a displacement arrangement for an adjustable seat part, for example, for a height adjustable seat cushion, as well as a (preferably electrically operated) weight sensor for the detection of seat occupancy using the weight of a person sitting in the corresponding motor vehicle seat. Through the detection of seat occupancy, it is possible to control various functional groups of a motor vehicle as a function of seat occupancy, such as, for example, automatic occupancy- and/or weight-dependent adjustment of certain seat components as well as the occupancy- and/or weight-dependent deployment of an airbag module.

The object of the invention is to specify a new, advantageous arrangement of a weight sensor on a seat structure.

This object is accomplished according to the invention through the provision of a seat assembly with the characteristics of claim 1.

Accordingly, the tubular drive element pivotably connected with a seat element is mounted on the seat element via the weight sensor.

The solution according to the invention has the advantage that a protected arrangement of the weight sensor between the tubular drive element and the associated seat element is possible, in which the sensor can, in particular, extend into the tubular drive element. The solution according to the invention further enables the integration of the weight sensor into a preassembled modular unit. This results in simple assembly and ease of assembly of the seat assembly as a whole.

The term weight sensor here means any sensor that generates sensor signals as a function of the force of the weight occurring when the seat is occupied.

The seat structure comprises all structural elements of a motor vehicle seat including its subassembly, for example, in the form of telescoping guide rails.

According to a preferred embodiment of the invention, the tubular drive element is pivotably mounted on a mounting section of the weight sensor, which extends axially into the inside of the tubular drive element or into a mounting element forming an adapter (tube adapter) nonpivotably connected to the tubular drive element and which can be provided for adaptation to tubular drive elements of different diameters by an adapter, in particular, in the form of an adapter bushing.

The pivotable mounting of the tubular drive element on the weight sensor occurs preferably via a mounting element arranged on the tubular drive element, which can, for example, be screwed on the inside or outside wall of the tubular drive element via suitable threads or can be attached thereto via any integral connection (produced by welding), via a frictional connection (produced by application of pressure) or a form-fitting connection. Furthermore, an integral attachment of a mounting element (serving as a tube adapter) on the tubular drive element can also occur using an adhesive, for example, by gluing the mounting element against the inside wall of the tubular drive element. The adhesive also serves here for the compensation or reconciliation of tolerances and holds the mounting element rattle-free in the tubular drive element.

According to a preferred improvement, the gluing of the mounting element into the tubular drive element occurs after making a preassembled assembly from the weight sensor and mounting element pivotably mounted thereon. For this, the mounting element must be axially retained on the mounting section of the weight sensor, for which known locking elements, such as, for example, nuts, can be used. Along one direction, the axial retention can even be implemented by the main body of the weight sensor itself.

According to one embodiment, the mounting element is designed with multiple parts, where one part of the mounting element has a bearing area for pivotable mounting on the mounting section of the weight sensor and the other part of the mounting element has an attachment area for nonpivotable connection to the tubular drive element. The two parts of the mounting element can be nonpivotably connected to each other via a screw connection, for example, in that the two parts of the mounting element are each designed as threaded bushings, of which one has on its inside the bearing area and on its outside a thread and the other has on its inside a thread and on its outside the attachment area for the connection to the tubular drive element. This can also be designed as a bearing bushing with the use of a one-piece mounting element.

According to one embodiment, the mounting section of the weight sensor serves as a radial bearing for the tubular drive element and has an additional support element for the axial retention of the tubular drive element in one direction, where the support element can be attached as a separate element on the mounting section or can be formed in one piece thereon. Along the opposing axial direction, the tubular drive element can be secured against axial displacement by the main body of the weight sensor.

According to another embodiment of the invention, the mounting section of the drive sensor [sic ? weight sensor] serves for both the radial and axial mounting of the tubular drive element. The mounting of the tubular drive element on the mounting section of the weight sensor can in this case be implemented via meshing threaded areas.

The weight sensor is preferably an electrically operated sensor, by means of which, upon loading of the motor vehicle seat with a motor vehicle passenger positioned thereon, the bending strain acting on the tubular drive element is detected. The solution according to the invention enables an arrangement of the weight sensor such that the transverse forces causing bending strain are supported under defined, reproducible conditions. For this, the weight sensor is arranged nonpivotably, e.g., by means of a lock nut, on the seat element serving for the mounting of the tubular drive element.

According to an improvement of the invention, the weight sensor consists of two sensor parts nonpivotably connected to each other, one of which serves for the pivotable mounting of the tubular drive element and the other to produce a nonpivotable connection with the associated seat element. This variant of the invention enables particularly advantageous integration of the weight sensor into the seat assembly between the tubular drive element and the associated seat element, in which, in particular, flexible conditions are produced for the creation of preassembled modular units including the weight sensor.

The tubular drive element can, in particular, be a drive tube for seat height displacement, which is rotated for adjustment of seat height and which runs from one seat side to the other seat side as a transverse tube at a right angle to the longitudinal seat direction.

The seat element serving for the mounting of the drive tube can, for example, be a seat side part or a guide rail for longitudinal displacement of the seat or a mounting angle attached thereon.

Additional characteristics and advantages of the invention will become clear with the following description of exemplary embodiments with reference to the figures.

They depict:

- Fig. 1a a first exemplary embodiment of a weight sensor preassembled on a drive tube, via which weight sensor the drive tube can be pivotably mounted on a seat part;
- Fig. 1b a first variant of the exemplary embodiment of Fig. 1a with regard to the axial retention of the drive tube relative to the weight sensor;
- Fig. 1c a second variant of the exemplary embodiment of Fig. 1a with regard to the axial retention of the drive tube relative to the weight sensor;
- Fig. 2a a variant of the exemplary embodiment of Fig. 1a with regard to the pivotable mounting of the drive tube on the weight sensor;
- Fig. 2b a first variant of the exemplary embodiment of Fig. 2a with regard to the axial retention of the drive tube relative to the weight sensor;
- Fig. 2c a second variant of the exemplary embodiment of Fig. 2a with regard to the axial retention of the drive tube relative to the weight sensor;
- Fig. 3 the arrangement of Fig. 2c together with a seat element, on which the drive tube is pivotably mounted via the weight sensor;
- Fig. 4 a variant of the exemplary embodiments of Fig. 1a and 2a with regard to the pivotable mounting of the drive tube on the weight sensor as well as with regard to the axial retention of the drive tube relative to the weight sensor;
- Fig. 5a a drive tube pivotably mounted on a side part of a seat via a two-part weight sensor,

- Fig. 5b a variant of the exemplary embodiment of Fig. 5a with regard to the attachment of the weight sensor on the side part of the seat;
- Fig. 6 a variant of the exemplary embodiment of Fig. 5b with regard to the pivotable mounting of the drive tube on the weight sensor
- Fig. 7 the arrangement of Fig. 5a together with additional seat components;
- Fig. 8 another exemplary embodiment of a weight sensor assembled on a drive tube, via which weight sensor the drive tube can be pivotably mounted on a seat part;
- Fig. 9 a schematic side view of a motor vehicle seat.

Fig. 9 schematically depicts a motor vehicle seat, whose seat structure comprises two seat side parts S arranged on the two longitudinal sides of the motor vehicle seat S (only one of which is discernible in the side view according to Fig. 9) as well as a seat back R tiltably connected to the two seat side parts. The seat side parts S serve to accommodate a seat bucket, on which a seat cushion constituting the seating surface for a motor vehicle passenger is arranged. The seat side parts S are in each case hingedly connected via front and rear adjusting levers V with a longitudinal seat guide that comprises a first guide rail (subrail U) fixedly arranged on a car body as well as a seat side guide rail displaceable relative to the rail fixed to the car body (upper rail O).

For adjustment of the seat height, i.e., the vertical distance of the seating surface from the longitudinal seat guide, the two adjusting levers V are hinged, with one of the adjusting levers associated with an adjustment drive and the other adjusting lever, as a passive adjustment lever merely reproduces the hinged movement induced by the first adjusting lever.

In the example of a seat structure depicted in Fig. 9, a drive tube 2 is associated with the rear adjusting lever V, which drive tube forms the lower axis via which the adjusting lever V is rotatably hinged to the upper rail O of the longitudinal seat guide. The drive tube 2 is designed as a transverse tube that runs from the rear adjusting lever V on one longitudinal side of the motor vehicle seat at a right angle to the longitudinal seat direction x (longitudinal axis of the vehicle or longitudinal direction of the rails) to the corresponding rear adjusting lever of the seat side part arranged on the other longitudinal side of the motor vehicle seat.

To determine the occupancy of the seat by a motor vehicle passenger in such a known motor vehicle seat, weight sensors are known that detect the occupancy of the seat using the difference in weight between an occupied and an unoccupied seat and, optionally, the weight of the user of the seat as well as determining the position and size of the user of the seat by determining a fictitious center of gravity. As a function of the occupancy of the seat, it is possible, for example, to control the longitudinal displacement of the seat by means of guide rails O, U or an air bag module associated with the motor vehicle seat.

Fig. 1a depicts a first exemplary embodiment of an arrangement according to the invention of a weight sensor 3 in a motor vehicle seat of the type depicted in Fig. 9. Accordingly, the weight sensor 3 constitutes an assembly that can be preassembled together with the drive tube 2, in which the drive tube 2 is pivotably mounted on the weight sensor 3. The weight sensor 3 is an electrically operated sensor, whose function will be presented in greater detail in the following with reference to Fig. 3. The weight sensor 3 has a main body 30 provided with an external thread 33, in which body the sensor components necessary to generate a weight-dependent sensor signal are arranged, as well as a journal 35 spaced at a distance from the main body 30 in the axial direction A (longitudinal direction of the drive tube 2), which extends into the inside of the drive tube 2.

On the threaded exterior of the wall 20 of the drive tube 2, a mounting element 4 in the form of a bearing bushing with a thread 41 is screwed. This mounting element 4 has a mounting section 44, which runs on the end of the drive tube 2 facing the sensor 3 all the way to the journal 35 of the weight sensor 3, spaced at a distance from its main body 40 such that the drive tube 2 is mounted radially via the mounting element 4 pivotably on the journal 35 of the weight sensor 3.

The main body 30 of the sensor 3 (which is arranged in front of one end of the drive tube 2 outside the drive tube) serves, on the one hand, for the axial retention of the drive tube 3 on the journal 35 of the weight sensor 3, as does, on the other hand, an axial locking element 36 arranged on the journal 35, e.g., in the form of a clamping ring. Thus, the mounting section 44 of the mounting element 4 attached on the drive tube 2 is accommodated axially substantially immobile between the main body 30 and the axial locking element 36 of the weight sensor 3.

Thus, the weight sensor 3 and the drive tube 2 constitute an assembly that can be preassembled, which is distinguished by simple construction as well as advantageous ease of installation on a corresponding seat element, cf. in this regard, the following statements about Fig. 3.

Fig. 1b depicts a variant of the arrangement of Fig. 1a, in which the difference consists in that the journal 35 of the weight sensor 3 has an external thread 35a, on which a nut is screwed as an axial locking element 37 (instead of the clamping ring 36 of Fig. 1a).

In the exemplary embodiment depicted in Fig. 1c, an adapter in the form of an adapter bushing 38 is screwed onto the external thread 35a of the journal 35 of the weight sensor 3, which adapter forms, on the one hand, a radial bearing for the drive tube 2, i.e., defines, together with the mounting element 4 of the drive tube 2, a radial bearing 45, and which serves, on the other hand (together with the main body 30 of the weight sensor 3), for the axial retention of the drive tube 2 relative to weight sensor 3.

The adapter bushing 38 enables adaptation of the journal 35 to drive tubes 2 of different diameters or to differently designed mounting elements 4.

Fig. 2a depicts a variant of the exemplary embodiment of Fig. 1a with regard to the attachment of the mounting element 4' in the form of a bearing bushing on the drive tube 2. According to Fig. 2a, the bearing bushing 4' with an external thread 42 is screwed into the inside wall 22 of the drive tube 2 provided with an internal thread. The mounting section 44 of this bearing bushing 4' is thus formed by the main body 40 provided with the thread 42. An axial locking element 36 in the form of a clamping ring serves here, as in the exemplary embodiment according to Fig. 1a, for the axial retention of the drive tube 2 mounted on the journal 35 of the weight sensor 3 via the radial bearing 45.

Fig. 2b depicts a variant of the arrangement of Fig. 2a, in which the axial locking element 37 is formed by a nut screwed onto an external thread 35a of the journal 35.

Fig. 2c depicts, in a variant of the arrangement of Fig. 2a, a weight sensor 3, in which an adapter bushing 39 is screwed onto the external thread 35a of the journal 35 that forms (according to the arrangement of Fig. 1c) a radial bearing 45 together with the bearing bushing 4' and, furthermore, serves for the axial retention of the drive tube 2 relative to the weight sensor 3.

The screwing of a bearing bushing 4' with a thread on the inside wall 22 of the drive tube 2 depicted in each case in Fig. 2a through 2c is particularly suited for drive tubes with large diameters or for those applications in which no space is available for attachment of the mounting element on the outside wall 21 of the drive tube 2.

Fig. 3 depicts the preassembled modular unit consisting of the drive tube 2 and the weight sensor 3 after incorporation into a motor vehicle seat, that accomplished by attachment on a mounting angle 1 of the corresponding seat structure, where the weight sensor 3 penetrates with its main body through an opening 10 of the mounting angle 1 substantially without play and is attached on the mounting angle 1 by means of a nut 51

as well as an associated lock nut 52, which are screwed on the two sides of the mounting angle 2 on the external thread 33 of the main body 30 of the weight sensor 3.

Thus, in this case, the weight sensor 3 is nonpivotably attached on the mounting angle 1 and also serves for the pivotable mounting of the drive tube 2 on the journal 35.

Accordingly, the drive tube 2 is thus pivotably connected via the weight sensor 3 to the seat element 1 in the form of a mounting angle. The weight sensor 3 here thus additionally assumes the necessary function of a pivotable mounting of the drive tube 2 on the mounting angle 1. In addition to the capability of preassembly of the weight sensor 3 with the drive tube 2 (with the main body 30 of the weight sensor 3 provided with an external thread 33 forming a defined interface with the associated seat element (mounting angle 1)) as well as the simple structure of the overall arrangement, the protected mounting of the weight sensor 3 - partially in the inside of the drive tube 2 and partially surrounded by the mounting angle 1 as well as the associated lock nut 51, 52 - is, above all, advantageous.

In addition, this arrangement ensures that the forces of weight occurring with occupancy of the corresponding motor vehicle seat, which act as transverse forces F on the drive tube 2, are always detected in the same manner by the sensor 3. This is attributed to the defined support of the sensor 3 with its main body 30 against the edge of the opening 10 of the mounting angle 1 clamped between the two nuts 51, 52. Thus, a bending of the drive tube 2 accompanying transverse forces F generated by seat occupancy that is detected by the sensor 3 via the journal 35 extending into the drive tube can be reproducibly determined and evaluated, such that erroneous deployments are reliably avoided.

Fig. 4 depicts a variant of the preassembled modular units depicted in Fig. 1a through 1c as well as 2a through 2c with regard to the attachment of the mounting element 4" on the drive tube 2. According to Fig. 4, the mounting element 4" is attached on one end of the drive tube 2, e.g., by welding. The radial bearing 45, via which the drive tube 2 is mounted on the journal 35 of the weight sensor 3, thus lies outside the interior of the

actual drive tube 2. For the axial retention of the drive tube 2 relative to weight sensor 3, a locking element in the form of a wedge 36' is pressed into a radial bore of the journal 35 extending into the inside of the drive tube 2. For this, a corresponding assembly opening M is provided in the wall 20 of the drive tube 2.

In the modular unit depicted in Fig. 5a, the weight sensor 3 is made up of two sensor parts 31, 32 nonpivotably connected to each other, of which one sensor part 31 serves for the nonpivotable connection of the weight sensor 3 to a mounting angle 1 of the seat structure and the other sensor part 32 serves for the pivotable mounting of the drive tube 2 on the weight sensor 3.

The first sensor part 31 penetrates an opening 10 of the mounting angle 1 and lies against the edge of the opening with an angled protrusion 31a. On the other side of the opening 10, a lock nut 51 is screwed onto an external thread 33 of the first sensor part 31, such that the mounting angle 1 is firmly clamped between the radially outward projecting protrusion 31a of the first sensor part 31 and the lock nut 51. The first sensor part 31 is thus fixed nonpivotably on the mounting angle 1. An electronic assembly 6 as well as an electric plug connector 60 of the weight sensor 3 are further arranged on the first sensor part 31, such that the sensor 3 [sic ?is] supplied with electrical energy via the first sensor part 31 and can output sensor signals through it.

The second sensor part 32 has a journal 35 extending into the inside of the drive tube 2, which, with a mounting element 4''' nonpivotably arranged on the inside wall of the drive tube 2, forms a radial bearing 45 for the pivotable mounting of the drive tube 2 on the weight sensor 3. For the axial retention of the drive tube 2 relative to the weight sensor 3, the mounting element 4''' is supported on the one hand on the main body of the second sensor part 32 and on the other (in the interior of the drive tube 2) on a locking element 37 in the form of a nut that is screwed onto an external thread 35a of the journal 35.

To prevent excess rigidity in the mounting of the drive tube 2 via the mounting element 4''' on the journal 35a, the mounting element 4''' and the journal 35 are spaced at a

distance from each other in the radial direction outside the radial bearing 45; a gap Z is thus present in each case in the radial direction to produce bearing clearance.

Fig. 5b depicts a variant of the exemplary embodiment of Fig. 5a, in which the difference consists in the attachment of the first sensor part 31 on the mounting angle 1. According to Fig. 5b, the first sensor part 31 is supported on a radially outward projecting protrusion 31a on the end of the edge of the opening 10 in the mounting angle 1 facing the drive tube 2, and the associated lock nut 52 is located on the end of the edge of the opening 10 facing away from the drive tube 2. The arrangement of the radial protrusion 31a and the associated lock nut is thus precisely reversed relative to the exemplary embodiment depicted in Fig. 5a. This enables complete preassembly of the assembly consisting of the drive tube 2 and the two sensor parts 31, 32, which is then introduced into the opening 10 of the mounting element 1, such that the first sensor part 31 with its section provided with an external thread 33 penetrates the opening 10 and lies with its radially projecting protrusion 31a against the edge of the opening. This positioning of the weight sensor 3 is then secured by the screwing on of the lock nut 52 on the external thread 33 of the first sensor part 31.

Fig. 6 depicts a variant of the arrangements of Fig. 5a and 5b, in which coordinated threaded areas 35a, 46 of the journal 35, on the one hand, and of the mounting elements 4'', on the other hand, serve for the mounting of the mounting element 4'' molded with the drive tube 2 on the journal 35 of the second sensor part 32. Thus, the bearing itself directly takes over the necessary axial retention of the drive tube relative to weight sensor 3. It is possible to do without additional, separate axial locking elements.

However, the forming of the bearing by meshing threaded areas by rotation of the drive tube 2 results in a relative movement of drive tube 2 and thread sensor 3 [sic ? weight sensor] along the tube axis A (corresponding to the transverse axis of the vehicle y), with the extent of this movement depending on the pitch of the meshing threads 35a, 46. This movement can be compensated by play provided in the arrangement as well as the ever-present elasticities.

Fig. 7 depicts the arrangement of Fig. 5a together with additional components of a seat structure, namely a subrail U that is fixed on the motor vehicle floor B as well as an upper rail O that is guided longitudinally displaceable on the subrail U and is attached on the mounting angle 1 that serves for the pivotable mounting of the drive tube 2 via the weight sensor 3. In Fig. 7, an adjusting lever V (cf. Fig. 9) nonpivotably connected to the drive tube 2 is further discernible, which lever serves for the adjustment of the seat height.

With reference to Fig. 7, the protected arrangement of the weight sensor 3 partially inside the drive tube 2 as well as partially covered by the mounting angle 1 and protected laterally by the guide O, U, in particular, becomes clear.

In the particularly easy to assemble exemplary embodiment depicted in Fig. 8, the weight sensor 3 is attached with its main body 30 to a mounting angle 1, which can serve, for example, for the arrangement of the weight sensor on a guide rail of a longitudinal seat guide of a motor vehicle seat. The weight sensor extends for this with its main body 30 substantially without play into an opening 10 of the mounting angles 1 and is fixed thereon by means of at least one nut 53 screwed onto an external thread 33 of the main body 30 of the weight sensor 3.

The weight sensor 3 has a mounting section 35a stepped in one piece from the main body 30, which forms two circumferential bearing surfaces 350, 351, oriented at right angles to each other and connecting directly with each other, on which a bearing bushing 4a provided with an external thread 452 is pivotably mounted by means of corresponding circumferential bearing surfaces 450, 451 oriented at right angles to each other.

The bearing bushing 4a is secured on the mounting section 35 of the weight sensor 3 in the axial direction on the one hand in that it is supported axially via its angled bearing surface 451 against the associated angled bearing surface 351 of the weight sensor 3 and

is secured in the opposite direction against axial slippage by means of a lock nut 37 screwed on to an external thread 352 of the weight sensor 3.

The bearing surfaces 350, 351; 450, 451 mentioned as well as the axial retention or mounting of the bearing bushing 4a by means of the associated lock nut 37 can optionally be supplemented by additional plain bearings and/or axial disks and improved in their efficiency. Furthermore, the bearing areas mentioned can be designed with angular movement to keep disrupting influences, such as, for example, tolerances or angular movements of the structure away from the weight sensor 3. To set predefined axial play between weight sensor 3 and bearing bushing 4a, the lock nut 37 is firmly screwed onto the weight sensor 3 up to a defined axial stop. For production engineering reasons, it may be necessary to use a spacing element 370 to bridge the thread runout in the lock nut 37.

Because of the axial retention of the bearing bushing 4a provided with an external thread 452 on the mounting section 35 of the weight sensor 30 between its angled bearing surface 351 on the one hand and the lock nut 37 on the other, the weight sensor 3 can be combined with the bearing bushing 4a into a preassembled assembly, onto which the drive tube 2 (in the form of a transverse shaft) is subsequently attached. For this, in the region of the front end of the main body 20 of the drive tube 2 a threaded bushing 4b provided with an internal thread 453 that runs along the end facing the weight sensor 3 with an attachment section 455 as well as along a part of the outside wall 21 of the drive tube 2 is attached (e.g., by welding). By screwing this threaded bushing 4b with its internal thread 453 onto the external thread 452 of the bearing bushing 4a, a nonpivotable connection is produced between drive tube 2 and bearing bushing 4a such that the drive tube 2 is mounted via the threaded bushing 4b and the bearing bushing 4a is pivotably mounted on the bearing surfaces 350, 351 of the mounting section 35 of the weight sensor 3.

In a preferred variant, the drive tube 2 and the threaded bushing 4b can be designed in one piece, with a thread 453 cut directly into the drive tube 2.

Alternatively to the above-described welded connections between the drive tube 2 and a respective mounting element, via which the drive tube 2 is mounted on the mounting section 35 of the weight sensor 3, a mounting element - optionally preassembled on the mounting section 35 of the weight sensor 3 - can also be attached by gluing on the drive tube 2, and, in particular, in fact, by an adhesive connection with the inside wall 22 of the drive tube 2. The adhesive also serves here for the compensation or reconciliation of tolerances on the inside of the drive tube 2 and holds the mounting element serving as an adapter rattle-free in the drive tube 2.